Etikonomi
Volume 23(2), 2024: 271 - 286
P-ISSN: 1412-8969; E-ISSN: 2461-0771
htttps://doi.org/10.15408/etk.v23i2.37788

Unleashing the Central Bank Digital Currency Revolution and its Impact on Exchange Rate: A Monetary Approach Synthesis

Akhmad Syakir Kurnia[1*], Muhammad Adnan Assidiq[2]
[1]Department of Economics and Development Studies, Diponegoro University, Indonesia
[2]Graduate School of Economics, Gadjah Mada University, Indonesia
E-mail: [1]akhmadkurnia@lecturer.undip.ac.id; [2]m.adnanasshidiq@gmail.com
[*)]Corresponding Author

JEL Classification:
D80
E58
F31

Received: 23 February 2024

Revised: 05 May 2024

Accepted: 09 May 2024

Available online: September 2024

Published regularly: September 2024

Abstract

Research Originality: The introduction of CBDC by the Central Bank of Indonesia has increased the intensity of news about CBDC. Besides aiming to introduce the future direction of the payment system, the news potentially causes uncertainty and speculation in the market, which may impact the rupiah exchange rate.

Research Objectives: This research analyzes the impact of CBDC news on the rupiah exchange rate, synthesizing a sticky price version of the monetary approach to the exchange rate.

Research Methods: A CBDC News Index is constructed based on a compilation of news data from major online media between 2018 and 2023. The structural VAR (SVAR) method is then employed to investigate the impact of CBDC news on the exchange rate dynamic.

Empirical Results: The results suggest a trend consistent with the hypothesis, indicating that news about CBDC may lead to pressure on the domestic currency, resulting in depreciation. However, the impact is not statistically convincing as the coefficient is not statistically different from zero. The monetary approach synthesis findings suggest that raising the policy rate is likely efficacious in counteracting the pressure of domestic currency depreciation. Meanwhile, other monetary approach variables exhibit anomalies related to exchange rate dynamics.

Implications: As the central bank plans to implement a Central Bank Digital Currency (CBDC), it must carefully control the dissemination of information about what the CBDC will entail and how it will be rolled out. CBDC blueprint and official disclosure help reduce uncertainty and speculation about implementing CBDC.

Keywords:
central bank digital currency; exchange rates; monetary approach; news shock; structural vector autoregression

How to Cite:

Kurnia, A. S. & Assidiq, M. A. (2024). Unleashing the Central Bank Digital Currency Revolution and Its Impact on Exchange Rate: A Monetary Approach Synthesis. *Etikonomi, 23*(2), 271 – 286. https://doi.org/10.15408/etk.v23i2.37788.

INTRODUCTION

Technological developments in the financial sector are proliferating. The advent of digitally encrypted Cryptocurrencies as a payment system beyond the control of monetary authorities has marked a radical revolution in the financial sector. On the one hand, digital payment systems encourage potential broader financial inclusion. On the other hand, it has raised concerns about risks to financial stability and payment systems itself. The high volatility and mining costs of cryptocurrencies make them an unstable and risky means of payment (Nabilou, 2020). Moreover, if cryptocurrencies are accepted as a means of payment, they threaten central banks' sovereignty in regulating payment systems (Schiller & Gross, 2021). As cryptocurrencies gain popularity as a decentralized payment system, not tied to any government, and operate on blockchain technology, central banks are challenged to explore digital currencies. Central Bank Digital Currency (CBDC) is developed to maintain control over the monetary system and ensure stability. CBDCs provide a regulated and government-backed alternative to decentralized cryptocurrencies (Alfar et al., 2023; Zhou, 2024).

The concept of a Central Bank Digital Currency (CBDC) and how it is supposed to be implemented have been under consideration by several countries worldwide (Bhaskar et al., 2022; Alonso et al., 2021). It is a digital form of a nation's official currency issued and regulated by that country's central bank. In contrast to decentralized cryptocurrencies such as Bitcoin or Ethereum, Central Bank Digital Currencies (CBDCs) are established and overseen by a government's central bank, giving it under the control of the central bank. Therefore, CBDCs are meant to replace cryptocurrencies, as the implementation of CBDCs provides substantial economic benefits (Bank of England, 2020).

The introduction of CBDC has raised attention and prompted scholarly discourse concerning its implementation and related issues. Several studies have highlighted the potential advantages of CBDC. Adopting CBDCs can save money handling costs, prevent counterfeiting, strengthen legal tender authorities, and improve payment systems' efficiency and safety by providing a secure and low-cost means of transferring funds. This could increase financial inclusion and enhance the payment system's inclusive character (Sun et al., 2017). CBDC can also promote faster and more complete monetary policy transmission by giving the central bank more control over the money supply and interest rates. This will be more helpful in achieving targets for inflation, output, and employment levels (Hanl & Michaelis, 2019; Davoodalhosseini, 2022; Zhou, 2024). In addition, CBDCs can boost economic growth as lower real interest rates encourage economic agents to increase consumption and investment (Barrdear & Kumhof, 2022), eliminate zero lower bound constraints, and thereby improve the effectiveness of negative interest rate policy-NIRP (Xin & Jiang, 2023). Moreover, CBDC-based NIRP could more effectively smooth macroeconomic fluctuations and alleviate the negative impact of an uncertainty shock, which is more conducive to restoring market confidence and promoting economic recovery (Xin & Jiang, 2023)

Concerning the banking system, a well and carefully designed CBDC has the potential to increase its stability because Banks engage in less maturity transformation

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttps://doi.org/10.15408/etk.v23i2.37788

when depositors have access to Central Bank Digital Currency (CBDC), reducing their risk of bank runs. Additionally, tracking the movement of funds into CBDC enables policymakers to detect and address struggling banks earlier, reducing the incentive for depositors to withdraw their funds in a panic (Keister & Monnet, 2022).

While it offers various benefits, CBDC also brings several challenges and threats. CBDC can exacerbate financial uncertainty during economic stress, in which users may procure CBDC without limit, leading to bank runs and financial instability (Williamson, 2022; Ferrari Minesso et al., 2022). Interest-bearing CBDC can also have a substitution effect from deposits to CBDC, leading to banking disintermediation and financial instability by affecting the demand for traditional bank deposits and other forms of money, reducing the reliance on commercial banks for payment services. (Chiu et al., 2019; Fegatelli, 2022). Disintermediation leads to reduced availability of bank funding and increased credit costs from the banking sector, which causes changes in the aggregate supply and demand in the economy (Bank of England, 2020). In addition, central banks face the challenge of attracting public attention and support for using CBDC (Sarmiento, 2022). An unavoidable concern is the risk of operational failure. Given the electronic nature of the financial system, central bank digital currency (CBDC) is susceptible to various malicious actions during offline scenarios, like blackouts or system shutdowns (Chu et al., 2022).

Few studies explore the implications of implementing central bank digital currencies (CBDCs) within the international monetary system, particularly concerning how a country's CBDC exchange rate aligns with another country's currency. The sparse body of literature focuses on the connection between central bank digital currencies (CBDCs) and exchange rates within the broader monetary policy framework. This research considers exchange rate stability as one of the critical issues in the realm of monetary policy under a CBDC regime. The introduction of CBDC could impact exchange rates by influencing capital flows and the demand for domestic and foreign currencies. Literature on CBDC suggests that CBDC may have several implications for macroeconomic fundamentals that can affect exchange rates. CBDC can increase economic growth through low-real interest rates (Barrdear & Kumhof, 2022) and increase the demand for money in an economy, which has implications for the exchange rate. Interest-bearing CDBCs can also cause interest rates faced by the public to change rapidly, which causes changes in the difference between foreign and domestic interest rates, which leads to the exchange rate (Meaning et al., 2018). On the other hand, CBDC can also lead to an increase in money supply, leading to disruption and inflation (Brunnermeier & Landau, 2022), which has implications for the exchange rate.

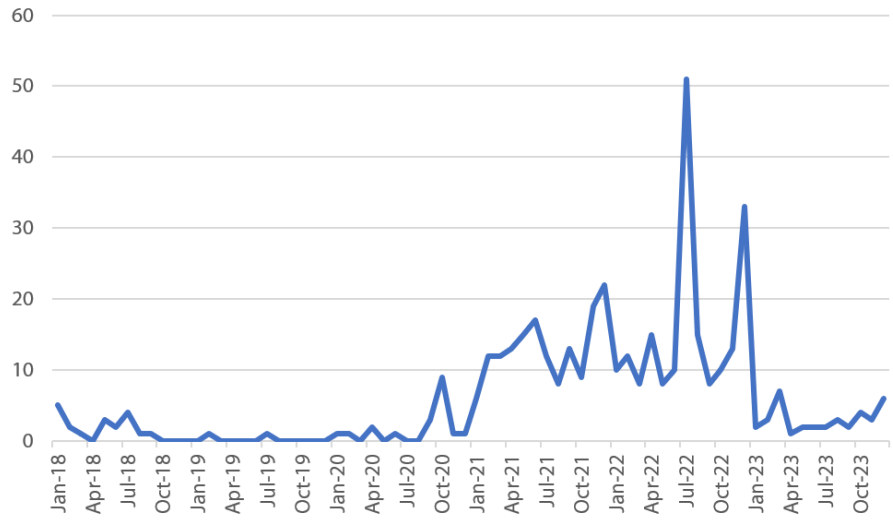
Most countries, including Indonesia, are still in the initial stages of preparing to adopt central bank digital currency (CBDC). The plan to implement CBDC as a new digital-based currency platform to replace the old is intrinsically intertwined with the emerging payment system ecosystem and evolving monetary policy landscape, both of which remain unclear. It leads to increased attention and uncertainty regarding the future trajectory of the economy. It causes economic actors to be more sensitive to news

information related to CBDC obtained, causing the volatility of currency exchange rates to increase (Wang et al., 2022).

Similar to the redenomination of the Rupiah, the redenomination of the Rupiah has been in the news a lot and has subsequently sparked speculation about when it will be carried out, what the implementation mechanism will be, and the consequences for the payment system and the economy as a whole. These speculations put pressure on exchange rate stability. With Bank Indonesia's recent announcement of plans to introduce CBDC in Indonesia, the central bank may encounter additional hurdles in maintaining exchange rate stability. This is particularly evident as the dissemination of information regarding CBDC has surged across various news media platforms in Indonesia. As depicted in Figure 1, there has been a notable upsurge in the recent coverage of CBDC-related news in Indonesia. This heightened coverage is poised to foster an atmosphere of increased uncertainty and speculation among economic actors in the foreign exchange market.

The circumstances show that it is crucial to empirically know how CBDC news impacts the stability of the rupiah exchange rate. No studies in Indonesia have examined the impact of central bank digital currency (CBDC) news on the Rupiah's exchange rate. Because it is still in the planning stage, existing studies that have come to the literature are in the form of theoretical literature. For example, Syarifuddin and Bakhtiar (2021) analyzed the monetary implications of CBDC implementation using a seven-sector DSGE model calibrated for Indonesian conditions. The results show that based on a closed economy model, CBDC can improve the effectiveness of monetary policy transmission.

Figure 1. CBDC News Intensity in Indonesia 2018-2023



Our research provides contributions in threefold. First, we propose an index that measures the intensity of CBDC-related news coverage named CBDC News Index (ICBDC). Second, while CBDC has not yet been implemented, media coverage reporting

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttps://doi.org/10.15408/etk.v23i2.37788

on CBDC is becoming more intense. The news about CBDC serves an educational role while also shaping market expectations and motivating economic agents to act rationally. Third, we synthesize a sticky price version of the monetary approach to exchange rates with CBDC news as a shock. Our model modified the naïve version of the flexible price of the monetary approach of the exchange rate by assuming that PPP holds only in the long run. The sticky price version assumes that the economy faces rigidity in the short run and that people adjust their expectations rationally. Unlike the flexible price version, which suggests that increased interest rates lead to domestic currency appreciation, the sticky price version suggests that the effect is ambiguous. If the money supply is more sensitive than the money demand in response to an increased interest rate, an increased policy rate (BI rate in Indonesia) will spurse even higher domestic currency depreciation.

METHODS

The Construction of the CBDC News Index

The CBDC index is calculated using the method developed by Wang et al. (2022), which is in line with the method of Baker et al. (2016), Huang & Luk (2020), and Lucey et al. (2022). However, the CBDC index calculation in our paper is different from Wang et al. (2022) in that we do weighting each news report based on the content of each news. Each piece of news is extracted based on three keywords of the financial sector related to Indonesia's CDBC initiative: payment systems, monetary policy, and financial stability. The Digital Rupiah CBDC White Paper released by Bank Indonesia states that Bank Indonesia will implement wholesale CBDC as the initial project to support financial system stability and monetary operations. It seems that Bank Indonesia directs CBDC as a support instrument to achieve financial system stability and monetary policy effectiveness goals. Therefore, financial system and monetary policy content are each assigned a higher weight of 0.4, while payment system content is given a weight of 0.2 as follows:

$$I_t = 0{,}4(Financial\ System) + 0{,}4(Monetary\ Policy) + 0{,}2(Payment\ System) \quad (1)$$

where l_t is the CBDC score at month t between January 2018 and December 2023. Keywords associated with the Financial System encompass terms such as financial system, infrastructure, finance, market, banking, wholesale, blockchain, and macroprudential. Those linked to Monetary Policy include remuneration, interest rate, transmission, monetary, market operation, exchange rate, inflation, money supply, and macroeconomy. Meanwhile, Payment Systems are characterized by keywords like wallet, retail, financial inclusion, transaction, digital Rupiah, and payment.

We observed online CBDC news from online media of CNN, Bisnis, CNBC, Detik, Media Indonesia, Kumparan, and Republika. The monthly CBDC news score, which is generated using equation *(1)*, is then normalized by the average and standard deviation value and then standardized by adding 100 to get the CBDC index as follows (Wang et al., 2022):

$$CBDCI_t = \left(\frac{(I_t - \mu)}{\sigma}\right) + 100$$

Where I_t is monthly score generated from equation *(1)*, μ and σ are average and standard deviation values, respectively.

CBDC and the Monetary Approach Synthesis

The monetary approach posits that the exchange rate between two countries' currencies is influenced by the balance of their respective money market equilibrium. This theory holds that variations in money market conditions can lead to shifts in the exchange rate. However, the link between the money markets and exchange rates is indirect. It operates through adjustments in relative prices, which ultimately affect exchange rates as they align with purchasing power parity. Accordingly, the validity of this approach hinges on whether purchasing power parity (PPP) holds. Given that many empirical studies have found inconsistencies with PPP, the flexible-price version of the monetary approach is often criticized as overly simplistic (Frankel, 1976; Boughton & Section, 1989). Accordingly, we adopt a synthesis of the sticky price version of the monetary approach as a correction to the flexible price and incorporate expectations at once.

$$m_t + \delta r_t = p_t + \Phi y_t - \lambda r_t \quad (3)$$

$$m_t^* + \delta r_t^* = p_t^* + \Phi y_t^* - \lambda r_t^* \quad (4)$$

$$s_t' = p_t - p_t^* \quad (5)$$

All variables in equations *(3), (4),* and *(5)* are in logarithmic form. Equations *(3)* and *(4)* demonstrate money market equilibrium conditions. The left-hand side of the equation exhibits the endogenous money supply consisting of exogenous components (m_t) and endogenous component, which is a function of interest rate (r_t) with a parameter of δ. The right-hand side of the equation is the nominal cash holding, which is assumed to be positively related to price changes (p_t), and output growth (y_t), and negatively related to interest rates (r_t). Equation *(5)* illustrates that PPP applies solely in the long term. The notation s_t' represents the long-run exchange rate to differentiate it from the short-run exchange rate (s_t). The * sign denotes the counterpart country.

The expectation of the exchange rate change is assumed to obey the following scheme:

$$s_{t+1}^e - s_t = \theta(s_t' - s_t) + (\pi_t^e - \pi_t^{e*}) \quad (6)$$

Equation *(6)* states that if the spot rates are below (or above) the long-run equilibrium level, the exchange rate is expected to depreciate (appreciate). In addition, the expected inflation differential ($\pi_t^e - \pi_t^{e*}$) leads to expected currency depreciation. This implies that the model accounts for market expectations by incorporating information from market equilibrium and the expected inflation rate. Combining equation *(6)* and the international fisher condition $s_{t+1}^e - s_t = r_t - r_t^*$, we obtain the following equation:

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttps://doi.org/10.15408/etk.v23i2.37788

$$s'_t - s_t = -{}^{1}/_{\theta}\,[(r_t - \pi^e_t) - (r^*_t - \pi^e_t)] \quad (7)$$

Putting equations *(3), (4), (5),* and *(7)* together while adding the CBDC news index as a shock results in the following equation:

$$s_t = (m_t - m^*_t) - \Phi(y_t - y^*_t) + (\delta + \lambda - 1)(r_t - r^*_t) + {}^{1}/_{\theta}\,(\pi^e_t - \pi^{e*}_t) + \mu ICBDC \quad (8)$$

Equation *(8)* can be elucidated as follows: First, an increase in domestic nominal money supply growth leads to a proportional increase in domestic prices and hence causes the domestic currency to depreciate. Second, increased domestic output leads to excessive nominal demand for money, leading to domestic currency appreciation. Third, a higher interest rate differential leads to an ambiguous effect on the exchange rate that depends on δ and λ. Both represent the sensitivity of money supply and demand changes in response to the increased interest rate. Fourth, market expectations represented by expected inflation differential affect the exchange rate, whereas a higher expected inflation differential leads to domestic currency depreciation. Finally, we hypothesize that the CBDC News Index has a positive relationship with the exchange rate, where an increase in the CBDC News Index leads to a depreciation of the domestic currency.

Empirical Strategy: Structural Vector Autoregression

We employ the structural vector autoregression (SVAR) model to test the structural shock analysis of the CBDC News Index to the Rupiah Exchange Rate. Initially, the validity of how the CBDC News Index is expected to affect other variables is examined using vector autoregressions, written as follows:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + x'_t + e_t \quad (9)$$

which p denotes the order of the VAR model, y_t is a *(K x 1)* vector of endogeneous variables, A are *(K x K)* coefficient matrices, x' is a set of exogenous variables and e_t is the error term, wherein the term of the VAR model is called unobserved structural innovations. Afterward, the impact of CBDC News Index shocks on the Rupiah Exchange Rate is examined using the Structural Vector Autoregression (SVAR) model by imposing restrictions on matrix A and adding error terms into the linear combination of structural shocks. The general structural representation is written as follows:

$$Ay_t = A^*{}_1 y_{t-1} + \cdots + A^*{}_p y_{t-p} + x'_t + Bu_t \quad (10)$$

where $u_t \sim (0, I_K)$, The A* are (K x K) coefficient matrices, and B is a structural form parameter matrix. This model follows the AB model by Lütkepohl (2005), where the structural shocks, u_t, are orthogonal and contemporaneously correlated. Thus, the correlation between the error of reduced and structural forms is:

$$Ae_t = Bu_t \quad (11)$$

Our structural model comprises four macroeconomic variables derived from the monetary approach to the exchange rate with a CBDC news index, which is exogenous. The macroeconomic variables are the rupiah exchange rate (s_t), interest rate differential $(r_t - r^*_t)$, money supply growth differential $(m_t - m^*_t)$, and economic growth differential (y-y^*). This

yields the reduced form disturbances: $e_t^{icbdc}, e_t^{r-r*}, e_t^{m-m*}, e_t^{y-y*} e_t^{\pi-\pi^*}, e_t^s$. The restriction of the structural response model, $Ae_t = Bu_t$, is specified as follows:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & \alpha_{32} & 1 & 0 & 0 & 0 \\ 0 & \alpha_{42} & \alpha_{43} & 1 & 0 & 0 \\ 0 & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 & 0 \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & 1 \end{bmatrix} \begin{bmatrix} e_t^{icbdc} \\ e_t^{r-r*} \\ e_t^{m-m*} \\ e_t^{y-y*} \\ e_t^{\pi-\pi^*} \\ e_t^s \end{bmatrix} = \begin{bmatrix} \beta_{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & \beta_{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & \beta_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & \beta_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & \beta_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & \beta_{66} \end{bmatrix} \begin{bmatrix} u_t^{icbdc} \\ u_t^{r-r*} \\ u_t^{m-m*} \\ u_t^{y-y*} \\ u_t^{\pi-\pi^*} \\ u_t^s \end{bmatrix} \quad (12)$$

Equation *(12)* elucidates the correlation between reduced form and structural shock for each endogenous variable. The focus is drawn to the sixth row, which describes the estimated structural factorization of exchange rate shock in a reduced form consisting *of* the CBDC news index $\left(e_t^{icbdc}\right)$, interest rate differential (e_t^{r-r*}), money supply differential (e_t^{m-m*}), economic growth differential shocks $\left(e_t^{y-y*}\right)$ and expected inflation differential $(e_t^{\pi-\pi^*})$.

Data and the Definition

The data used in this study are as follows:

Rupiah exchange rate is defined as *IDR/USD*

Interest rate differential is the difference between the Bank Indonesia (BI) Rate and the Fed Funds Rate $(r - r^*)$.

The money supply growth differential is the difference between Indonesia's and the United States money supply growth $(m - m^*)$.

Economic growth differential is the difference between Indonesia's GDP growth (yoy) and the United States $(y - y^*)$.

The inflation differential is the difference between Indonesia's inflation (yoy) and the United States $(\pi^e - \pi^{e*})$.

The CBDC News Index (ICBDC) is generated from a weighted composite index. The data is collected from major online news media in Indonesia, such as CNN Indonesia, CNBC Indonesia, Bisnis, Detik, Republika, and Media Indonesia. All data is monthly data for a period from 2018 to 2023.

RESULTS AND DISCUSSION

Non-stationary data used in VAR estimation will result in spurious regression results. Therefore, we check the data to ensure that it follows a stationary process and that our estimation results are valid and reliable. For that purpose, we used the Augmented Dickey-Fuller (ADF) test. The test results show that some data are stationary at a level and some at first difference *I(1)*. Thus, we estimate the VAR model using the first difference data. Appendix 1 shows the ADF test results.

Lag length selection in Vector Autoregression (VAR) is crucial because it risks a misspecification bias that dramatically impacts the model's performance, interpretability, and

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttps://doi.org/10.15408/etk.v23i2.37788

reliability of the results (Hafer & Sheehan, 1989; Schorfheide, 2005). A lag length that is too high will cause over-parametrization conditions, bearing the emergence of noise along with the underlying patterns. On the other hand, under-parameterization conditions occur if the lag length is too low, so the model fails to capture the essential dynamics in the time series data. Thus, selecting the optimal lag length in VAR involves balancing statistical validity, computational feasibility, and theoretical justification (Hafer & Sheehan, 1989).

We estimate the VAR model with a lag length of 1. The quick response of financial markets to new information, regulatory requirements, or inherent characteristics of the financial data justifies the selection of a lag length of 1 in a VAR. We also use statistical criteria to determine the optimal lag length. The result aligns with the theoretical justification. Appendices 2 and 3 show the statistical criteria for selecting the optimal lag length and VAR model estimate. The estimate of VAR was conducted by imposing several restrictions on equation *(9)*.

Structural VAR Analysis Results

The structural VAR models are estimated using maximum likelihood based on the variance-covariance matrix of the reduced form and the restrictions imposed on the structural model. Maximization was conducted using numerical optimization methods and a scoring algorithm. The formal over-identification test does not reject the over-identified model estimated at the 5 percent level, which indicates that the estimated model is fit and that the structural restrictions used are valid. The SVAR estimate of equation *(12)* is shown in Table 1.

Table 1. Estimates of the Reduced form (Matrix A)

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0.021620^{***} & 1 & 0 & 0 & 0 \\ 0 & 0.424203^{***} & 23.55114^{***} & 1 & 0 & 0 \\ 0 & -0.275834^{*} & -0.845231 & -0.101031^{**} & 1 & 0 \\ 0.139295 & -0.014263^{*} & -0.531579^{***} & 0.001488 & -0.005301 & 1 \end{bmatrix}$$

Note:
*)p<0.1; **) p<0.05; ***) p<0.01

The sixth row shows the estimated coefficient of structural factorization of exchange rates in the reduced form involving the CBDC news index $\left(e_t^{icbdc}\right)$, interest rate differential (e_t^{r-r*}), money supply differential (e_t^{m-m*}), economic growth differential shocks $\left(e_t^{y-y*}\right)$ and expected inflation differential $(e_t^{\pi-\pi^*})$. The estimate of the coefficient α_{61} = 0.139295 is not statistically significant, indicating that the CBDC News Index as a shock has no impact on exchange rate changes. However, it suggests that the coefficient exhibits a positive sign, confirming the direction of how the shock is expected to influence the exchange rate.

The estimated coefficient α_{62} -0.014263 has a negative sign and is statistically significant, suggesting that an increase in the interest rate differential leads to an appreciation of the domestic currency. This finding confirms a critical aspect of the

sticky price model where the influence of changes in interest rates on the exchange rate occurs through both money supply and money demand channels. Whether a higher differential interest rate causes an appreciation of the domestic currency or vice versa depends on the sensitivity of changes in money supply and money demand to changes in the interest rate differential. The domestic currency is likely to appreciate only when the money supply and demand are relatively insensitive to rising interest rates, allowing the higher interest rate differential to impact domestic currency appreciation.

The coefficients of the remaining variables synthesized in the monetary approach, α_{63}, α_{64} and α_{65} exhibit a divergent trend from the Monetary Approach Synthesis, notably with α_{63} being statistically significant with a negative sign. This suggests that the effect of output growth on the exchange rate does not align with the monetary approach framework.

Figure 2. Response of Rupiah Exchange Rate to Structural VAR Shock

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttps://doi.org/10.15408/etk.v23i2.37788

We then examine the impulse response dynamics within the estimated structural VAR systems. The analysis focuses on how the Rupiah Exchange Rate responds to the CBDC News Index shock. In addition, we also examine how the Rupiah exchange rate responds to the shock of macroeconomic variables synthesized in the monetary approach to the exchange rate model. Figure 2 displays the impulse response based on the SVAR estimates. Figure 2 shows that the Rupiah Exchange Rate generally responds to shocks from all variables in the short term, no more than six months. The Rupiah exchange rate reacts initially to interest rate shocks, typically depreciating in the early period following the shock and then bouncing back to appreciate and stabilizing after the fifth period. A positive shock of the money supply causes an initial depreciation of the Rupiah currency, stabilizing the depreciation within the fourth period. Conversely, a positive economic growth shock prompts an initial Rupiah appreciation at the beginning, stabilizing in the fifth period after the shock. Lastly, the Rupiah currency is volatile in response to news about CBDC in the early period. However, the volatility subsided within five months. In other words, traces of the influence of news about CBDC on the Rupiah currency disappear after five months of news.

Claiming that the CBDC news index is putting pressure on the Rupiah currency is unlikely convincing. Although the estimation shows a positive coefficient, suggesting that CBDC news shocks may contribute to Rupiah depreciation due to increased uncertainty, the coefficient is not statistically significant. This result contrasts with the findings of Wang et al. (2022), which demonstrate a significant positive correlation between the CBDC News Index and currency exchange rate volatility in financial markets. We posit that the limited impact of news regarding CBDC on exchange rate stability in Indonesia stems from its official sourcing from Bank Indonesia, thereby mitigating market uncertainty and speculation. Bank Indonesia's publication of the 2025 CBDC Blueprint helps mitigate uncertainty and speculation regarding the economic trajectory of CBDC. This contrasts with the discourse surrounding the Rupiah redenomination, which causes uncertainty and speculation in financial markets (Lianto & Suryaputra, 2012; Mahardika et al., 2015; Astrini et al., 2016; Karnadi & Adijaya, 2017).

Moreover, people are already familiar and comfortable with digital transaction platforms provided by private providers. On the one hand, people have perceived the benefits and become comfortable with digital transactions whose platforms are provided by the private sector; on the other hand, there are still concerns about the risks of using digital currency, especially related to security issues, regulatory uncertainty, lack of consumer protection, and market manipulation. In this regard, the central bank's issuance of official digital currency is perceived as a positive thing in overcoming privately provided digital currency platforms that concern people (Al-Okaily et al., 2020; Alaa Mahdi Sahi et al., 2021; Susanto et al., 2022; Norbu et al., 2024; Najib & Fahma, 2020; A M Sahi et al., 2021; Kumar et al., 2017).

The monetary approach to exchange rates has long served as a foundational framework in open macroeconomic analysis. However, the validity of the approach remains debated due to mixed empirical findings (DeJong & Husted, 1993), which is

the case with the findings in our research. We identified a critical issue in the sticky price version of the monetary approach, demonstrating that a rise in the interest rate differential leads to an appreciation of the domestic currency. This finding is critical because it validates the central bank's actions in response to the pressure of domestic currency depreciation. When the Rupiah comes under depreciation pressure, Bank Indonesia typically responds by raising the policy interest rate. Given the ambiguity of how an increased policy rate impacts exchange rates, these empirical results validate the central bank's current strategy.

CONCLUSION

Given that the CBDC as an official and regulated digital currency has been in the pipeline to be introduced, this paper contributes to adding empirical literature on CBDC. Numerous issues are under discussion regarding the optimal form of CBDC, its implementation strategies, and how CBDC impacts other macroeconomic variables. This paper investigated the exchange rate against the CBDC News index based on the sticky price version of the monetary approach to exchange rate synthesis. The CBDC news index was generated from weighted components comprising the financial system, monetary policy, and payment system identified based on the keywords contained in the CBDC news reports by major online mass media from 2018 to 2023.

Our approach results in two main findings. First, the presence of a CBDC blueprint by the central bank, coupled with information sourced directly from the central bank, serves to mitigate uncertainty and speculation surrounding CBDC implementation. The public's widespread familiarity with digital platforms in daily transactions further diminishes the impact of CBDC-related news on exchange rate shocks. Secondly, our approach reveals a critical aspect of the sticky price version of the monetary approach to the exchange rate in which the policy rate serves as an effective instrument to help reduce pressure on domestic currency depreciation. It validates the central bank's use of policy rate instruments to counteract pressure on the domestic currency to depreciate. On the other hand, the impact of macroeconomic variables other than interest rates, which diverge from the assumptions of the monetary approach, further adds to the mixed results of its empirical studies.

REFERENCES

Alfar, A. J. K., Kumpamool, C., Nguyen, D. T. K., & Ahmed, R. (2023). The Determinants of Issuing Central Bank Digital Currencies. *Research in International Business and Finance*, *64*, 101884. https://doi.org/10.1016/j.ribaf.2023.101884.

Al-Okaily, M., Lutfi, A., Alsaad, A., Taamneh, A., & Alsyouf, A. (2020). The Determinants of Digital Payment Systems' Acceptance under Cultural Orientation Differences: The Case of Uncertainty Avoidance. *Technology in Society*, *63*, 101367. https://doi.org/10.1016/j.techsoc.2020.101367.

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttps://doi.org/10.15408/etk.v23i2.37788

Alonso, S. L. N., Jorge-Vazquez, J., & Forradellas, R. F. R. (2021). Central Banks Digital Currency: Detection of Optimal Countries for the Implementation of a CBDC and the Implication for Payment Industry Open Innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), 1–23. https://doi.org/10.3390/joitmc7010072.

Astrini, D., Juanda, B., & Achsani, N. A. (2016). Impact of Redenomination on Price, Volume, and Value of Transaction: an Experimental Economic Appraoch. *Buletin Ekonomi Moneter dan Perbankan*, *19*(2), 207–238. https://doi.org/10.21098/bemp.v19i2.630.

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring Economic Policy Uncertainty. *The Quarterly Journal of Economics*, *131*, 1593–1636. https://doi.org/10.1093/qje/qjw024.Advance.

Bank of England. (2020). Central Bank Digital Currency Opportunities, Challenges and Design. *Bank of England Discussion Paper March 2020*.

Barrdear, J., & Kumhof, M. (2022). The Macroeconomics of Central Bank Digital Currencies. *Journal of Economic Dynamics and Control*, *142*. https://doi.org/10.1016/j.jedc.2021.104148.

Bhaskar, R., Hunjra, A. I., Bansal, S., & Pandey, D. K. (2022). Central Bank Digital Currencies: Agendas for Future Research. *Research in International Business and Finance*, *62*, 101737. https://doi.org/10.1016/j.ribaf.2022.101737.

Boughton, J. M., & Section, I. F. (1989). The Monetary Approach to Exchange Rates: What Now Remains. *Journal of International Economics, 27*(3–4). https://doi.org/10.1016/0022-1996(89)90067-6.

Brunnermeier, M., & Landau, J-P. (2022). *The Digital Euro: Policy Implications and Perspectives.* Luxembourg: European Parliament.

Chiu, J., Davoodalhosseini, M., Jiang, J., & Zhu, Y. (2019). Bank Market Power and Central Bank Digital Currency: Theory and Quantitative Assessment. *Journal of Politicak Economy, 131*(5), 1213-1248. https://doi.org/10.1086/722517.

Chu, Y., Lee, J., Kim, S., Kim, H., Yoon, Y., & Chung, H. (2022). Review of Offline Payment Function of CBDC Considering Security Requirements. *Applied Sciences*, *12*(9), 4488. https://doi.org/10.3390/app12094488.

Davoodalhosseini, S. M. (2022). Central Bank Digital Currency and Monetary Policy. *Journal of Economic Dynamics and Control*, *142*, 104150. https://doi.org/10.1016/j.jedc.2021.104150.

DeJong, D. N., & Husted, S. (1993). Towards a Reconciliation of the Empirical Evidence on the Monetary Approach to Exchange Rate Determination. *The Review of Economics and Statistics, 75* (1), 123-128. https://doi.org/10.2307/2109634.

Fegatelli, P. (2022). A Central Bank Digital Currency in a Heterogeneous Monetary Union: Managing the Effects on the Bank Lending Channel. *Journal of Macroeconomics*, *71*, 103392. https://doi.org/10.1016/j.jmacro.2021.103392.

Ferrari Minesso, M., Mehl, A., & Stracca, L. (2022). Central Bank Digital Currency in an Open Economy. *Journal of Monetary Economics*, *127*, 54–68. https://doi.org/10.1016/j.jmoneco.2022.02.001.

Frankel, J. (1976). A Monetary Approach to the Exchange Rate : Doctrinal Aspects and Empirical Evidence. *The Scandinavian Journal of Economics*, *78*(2), 200–224.

Hafer, R. W., & Sheehan, R. G. (1989). The Sensitivity of VAR Forecasts to Alternative Lag Structures. *International Journal of Forecasting*, *5*(3), 399–408. https://doi.org/10.1016/0169-2070(89)90043-5.

Hanl, A., & Michaelis, J. (2019). Central Bank Digital Currency as a New Instrument of Monetary Policy. *Wirtschaftsdienst*, *99*(5), 340–347. https://doi.org/10.1007/s10273-019-2454-4.

Huang, Y., & Luk, P. (2020). Measuring Economic Policy Uncertainty in China. *China Economic Review*, *59*, 101367. https://doi.org/10.1016/j.chieco.2019.101367.

Karnadi, E. B., & Adijaya, P. R. (2017). Redenomination: Why is It Effective in One Country but Not in Another? *International Journal of Economics and Financial Issues*, *7*(3), 186–195.

Keister, T., & Monnet, C. (2022). Central Bank Digital Currency: Stability and Information. *Journal of Economic Dynamics and Control*, *142*, 1–20. https://doi.org/10.1016/j.jedc.2022.104501.

Kumar, P., Dasari, Y., Jain, A., & Sinha, A. (2017). Digital Nations - Smart Cities, Innovation & Sustainability. *Proceeding of the 16th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society, 13E 2017.*

Lianto, J., & Suryaputra, R. (2012). The Impact of Redenomination in Indonesia from Indonesian Citizens' Perspective. *Procedia -Social and Behavioral Sciences*, *40*, 1–6. https://doi.org/10.1016/j.sbspro.2012.03.153.

Lütkepohl, H. (2005). *New Introduction to Multiple Time Series Analysis*. Berlin: Springer.

Lucey, B. M., Vigne, S. A., Yarovaya, L., & Wang, Y. (2022). The Cryptocurrency Uncertainty Index. *Finance Research Letters*, *45*, 102147. https://doi.org/10.1016/j.frl.2021.102147.

Najib, M., & Fahma, F. (2020). Investigating the Adoption of Digital Payment System Through an Extended Technology Acceptance Model: An Insight from the Indonesian Small and Medium Enterprises. *International Journal on Advanced Science, Engineering and Information Technology*, *10*(4), 1702–1708. https://doi.org/10.18517/ijaseit.10.4.11616.

Norbu, T., Park, J. Y., Wong, K. W., & Cui, H. (2024). Factors Affecting Trust and Acceptance for Blockchain Adoption in Digital Payment Systems: A Systematic Review. *Future Internet*, *16*(3), 1–21. https://doi.org/10.3390/fi16030106.

Mahardika, H., Sembada, A. Y., & Narhetali, E. (2015). Adapting to Zeroes: Investigating the Need for a Transition Period in the Proposed Rupiah Redenomination Plan. *Journal for International Business and Entrepreneurship Development*, *8*(4), 346. https://doi.org/10.1504/jibed.2015.072925.

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: https://doi.org/10.15408/etk.v23i2.37788

Meaning, J., Dyson, B., Barker, J., & Clayton, E. (2018). Broadening Narrow Money: Monetary Policy with a Central Bank Digital Currency. *Bank of England Working Paper No. 724.*

Nabilou, H. (2020). The Dark Side of Licensing Cryptocurrency Exchanges as Payment Institutions. *Law and Financial Markets Review*, *14*(1), 39–47. https://doi.org/10.1080/17521440.2019.1626545.

Sahi, A M, Khalid, H., & Abbas, A. F. (2021). Digital Payment Adoption: a Review (2015-2020). *Journal of Management Information and Decision Sciences*, *24*(7), 1–9.

Sahi, Alaa Mahdi, Khalid, H., Abbas, A. F., & Khatib, S. F. A. (2021). The Evolving Research of Customer Adoption of Digital Payment: Learning from Content and Statistical Analysis of the Literature. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(4), 230. https://doi.org/10.3390/joitmc7040230.

Sarmiento, A. (2022). Seven Lessons from the e-Peso Pilot Plan: The Possibility of a Central Bank Digital Currency. *Latin American Journal of Central Banking*, *3*(2), 100062. https://doi.org/10.1016/j.latcb.2022.100062.

Schiller, J., & Gross, J. (2021). A Model for Central Bank Digital Currencies: Implications for Bank Funding and Monetary Policy. *Proceeding VfS Annual Conference 2021.*

Schorfheide, F. (2005). VAR Forecasting Under Misspecification. *Journal of Econometrics*, *128*(1), 99–136. https://doi.org/10.1016/j.jeconom.2004.08.009.

Sun, H., Mao, H., Bai, X., Chen, Z., Hu, K., & Yu, W. (2017). Multi-Blockchain Model for Central Bank Digital Currency. *Proceeding the 18th International Conference on Parallel and Distributed Computing, Applications and Technologies*. https://doi.org/10.1109/PDCAT.2017.00066.

Susanto, E., Solikin, I., & Purnomo, B. S. (2022). a Review of Digital Payment Adoption in Asia. *Advanced International Journal of Business, Entrepreneurship and SMEs*, *4*(11), 1–15. https://doi.org/10.35631/aijbes.411001.

Syarifuddin, F., & Bakhtiar, T. (2022). The Macroeconomic Effects of an Interest-Bearing CBDC: A DSGE Model. *Mathematics*, *10*(10), 1–33. https://doi.org/10.3390/math10101671.

Wang, Y., Lucey, B. M., Vigne, S. A., & Yarovaya, L. (2022). The Effects of Central Bank Digital Currencies News on Financial Markets. *Technological Forecasting and Social Change*, *180*. https://doi.org/10.1016/j.techfore.2022.121715.

Williamson, S. D. (2022). Central Bank Digital Currency and Flight to Safety. *Journal of Economic Dynamics and Control*, *142*, 104146. https://doi.org/10.1016/j.jedc.2021.104146.

Xin, B., & Jiang, K. (2023). Economic Uncertainty, Central Bank Digital Currency, and Negative Interest Rate Policy. *Journal of Management Science and Engineering*, *8*(4), 430–452. https://doi.org/10.1016/j.jmse.2023.04.001.

Zhou, C. (2024). Evaluating the Effectiveness of Monetary Policy for Retail Central Bank Digital Currency. *Latin American Journal of Central Banking*, *August*, *5*(3), 100111. https://doi.org/10.1016/j.latcb.2023.100111.

Appendix 1. McKinnon *t* Statistics of ADF Unit Root Test

Variables	Level, *I(0)*	First Difference, *I(1)*
s	-4.149826***	-7.331635***
ICBDC	-3.063314	-3.884408***
$r_t - r_t^*$	-1.440610	-5.584722***
$m_t - m_t^*$	-0.997318	-9.232152***
$y_t - y_t^*$	-1.877763*	-2.484285**
$\pi_t^e - \pi_t^{e*}$	-2.081572**	-2.674932***

Note:
***) Reject the non-stationary null hypothesis at a *99 %* confidence level.
**) Reject the non-stationary null hypothesis at a *95 %* confidence level.

Appendix 2. Optimal Lag Length Criteria

Lag	Optimal Lag Length Criteria			
	FPE	AIC	HQ	SC
0	2.24e-12	-9.798326	-9.600891*	-9.720201
1	9.08e-13*	-10.70477*	-9.322728	-10.15789*
2	1.30e-12	-10.37071	-7.804048	-9.355072
3	1.04e-12	-10.65962	-6.908348	-9.175230
4	1.49e-12	-10.43270	-5.496823	-8.479563

Appendix 3. Estimate of Restricted VAR Model

	ICBDC	$r - r^*$	$m - m*$	$(y - y)$	$\pi^e - \pi^{e*}$	*s*
$ICBDC_{t-1}$	-0.344958	-	-	-	-	-0.501710
	(0.10733)					(0.23548)
	[-3.21391]					[-2.13060]
$(r - r^*)_{t-1}$	-	0.364987	-0.019045	0.177322	-0.295252	-0.023297
		(0.11125)	(0.00652)	(0.44080)	(0.17003)	(0.00885)
		[3.28086]	[-2.91984]	[0.40228]	[-1.73642]	[-2.63243]
$(m - m^*)_{t-1}$	-	-	-0.197186	-0.176066	0.841989	-0.181597
			(0.12590)	(9.14791)	(3.47359)	(0.18334)
			[-1.56624]	[-0.01925]	[0.24240]	[-0.99049]
$(y - y)_{t-1}$	-	-	-0.001211	0.414558	-0.070769	-0.003115
			(0.00152)	(0.11066)	(0.04203)	(0.00222)
			[-0.79504]	[3.74613]	[-1.68392]	[-1.40062]
$(\pi^e - \pi^{e*})_{t-1}$	-	-	0.003780	0.625109	0.406799	-0.000608
			(0.00394)	(0.28616)	(0.10879)	(0.00586)
			[0.95970]	[2.18445]	[3.73941]	[-0.10363]
DLS(-1)	-	-	0.008131	5.374924	0.180482	-0.169388
			(0.08252)	(5.99612)	(2.27679)	(0.12015)
			[0.09853]	[0.89640]	[0.07927]	[-1.40978]
C	0.000210	-0.008834	0.000853	0.003109	-0.021478	0.001849
	(0.00128)	(0.04228)	(0.00219)	(0.14431)	(0.05721)	(0.00289)
	[0.16390]	[-0.20895]	[0.38992]	[0.02154]	[-0.37541]	[0.63903]
R-squared	0.153450	0.133504	0.117511	0.275091	0.205910	0.153433
Sum sq. resids	0.008009	8.745845	0.023289	101.0891	15.90111	0.040637
Mean dependent	0.000206	-0.013969	0.000901	-0.003381	-0.024429	0.001700
S.D. dependent	0.011709	0.382466	0.019557	1.421628	0.538709	0.026376

Note: Standard errors in ( ) & t-statistics in [ ]

https://journal.uinjkt.ac.id/index.php/etikonomi
DOI: htttps://doi.org/10.15408/etk.v23i2.37788